

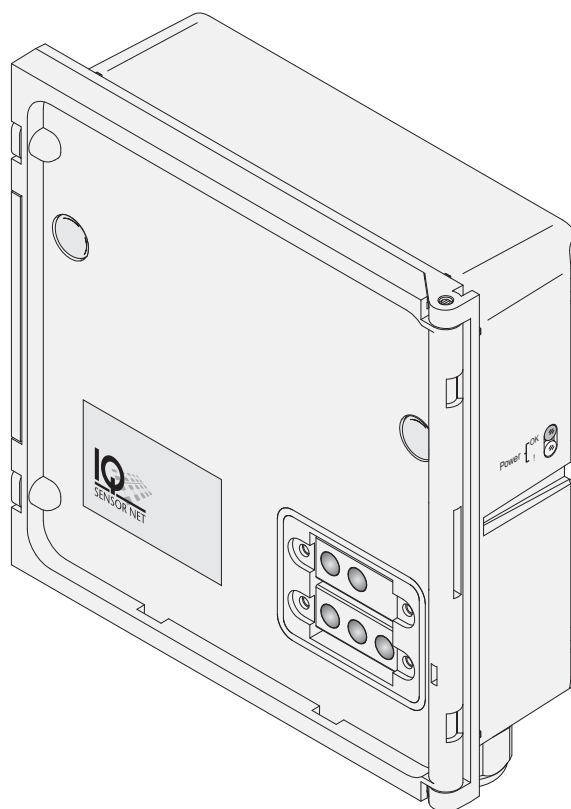


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Operating manual

# IQ SENSOR NET MIQ/CR3; DIQ/CR3



**IQ SENSOR NET combi output module**



**Note**

For the most recent version of the manual, please visit [www.ysi.com](http://www.ysi.com).

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# 1 Overview

## 1.1 How to use this component operating manual

### Structure of the IQ SENSOR NET operating manual

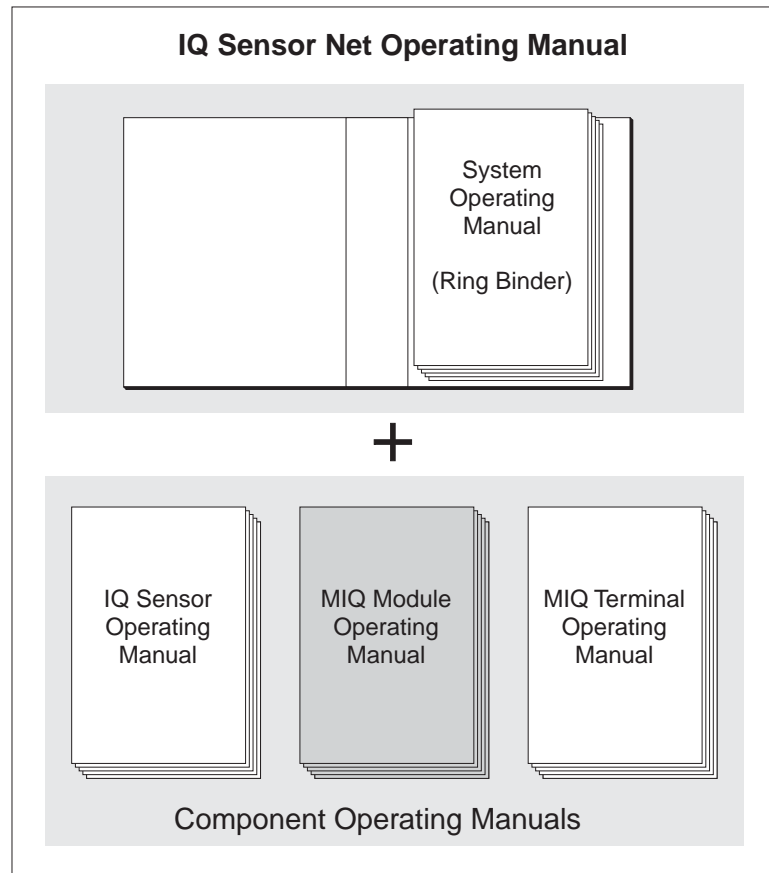


Fig. 1-1 Structure of the IQ SENSOR NET operating manual

The IQ SENSOR NET operating manual has a modular structure like the IQ SENSOR NET itself. It consists of a system operating manual and the operating manuals of all the components used.

Please file this component operating manual into the ring binder of the system operating manual.

## 1.2 Features of the combi output module

### General characteristics

The combi output module has three current outputs and three relay outputs. You can link current outputs and relay outputs to sensors. The linked current outputs and relay outputs can, for example, be used to monitor sensors or to output measurement data. Unlinked relay outputs can be used for general monitoring functions.

With the standard MIQ module housing, the combi output module has the same characteristics as all MIQ modules regarding stability, leakproofness and weather resistance. It also provides the same wide variety of installation options (stacked mounting, canopy mounting, tophat rail mounting, etc.).

### Instrument types

The MIQ/CR3 and DIQ/CR3 combi output modules differ in their compatibility with the individual IQ SENSOR NET system families.

System	Compatible combi output module
2020 XT	MIQ/CR3
182	DIQ/CR3

### Terminal strip

The combi output module has the following electrical connections on the terminal strip inside the housing:

- 3 x relay contact
- 3 x current output
- 2 x SENSORNET connection

## 2 Safety instructions

This operating manual contains special instructions that must be followed during the installation of the combi output module. Thus, it is essential for the operator to read this component operating manual before carrying out any work with the system. In addition to this manual, the SAFETY chapter of the IQ SENSOR NET system operating manual must be followed.

Always keep this component operating manual together with the system operating manual and all other component operating manuals in the vicinity of the IQ SENSOR NET system.

### Special user qualifications

External circuits carrying mains voltage must only be connected to the relay contacts by a qualified electrician.

### General safety instructions

Safety instructions in this operating manual are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "Caution") indicates the danger level:



#### Warning

indicates instructions that must be followed precisely in order to prevent serious dangers to personnel.



#### Caution

indicates instructions that must be followed precisely in order to avoid slight injuries to personnel or damage to the instrument or the environment.

### Other labels



#### Note

This symbol indicates instructions that describe special features.



#### Note

indicates cross-references to other documents, e.g. operating manuals.

## 2.1 Authorized use

The authorized use of the combi output module consists of providing relay and current outputs in the IQ SENSOR NET.

Please observe the technical specifications according to chapter 6 TECHNICAL DATA. Only operation according to the instructions in this operating manual is authorized.

Any other use is considered to be **unauthorized**. Unauthorized use invalidates any claims with regard to the guarantee.

## 2.2 General safety instructions

The combi output module is constructed and inspected according to the relevant guidelines and norms for electronic instruments (see chapter 6 TECHNICAL DATA).

It left the factory in a safe and secure technical condition.

### Function and operational safety

The failure-free function and operational safety of the combi output module is only guaranteed if the generally applicable safety measures and the special safety instructions in this operating manual are followed during its use.

The failure-free function and operational safety of the combi output module is only guaranteed under the environmental conditions that are specified in chapter 6 TECHNICAL DATA.

### Safe operation

If safe operation is no longer possible, the combi output module must be taken out of operation and secured against inadvertent operation. Safe operation is no longer possible if the combi output module:

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer operates as described in this manual.

If you are in any doubt, contact the supplier of your combi output module.



## 3 Installation

### 3.1 Scope of delivery

The scope of delivery of the combi output module is listed in the INSTALLATION chapter of the system operating manual.

### 3.2 Installation in the IQ SENSOR NET

The IQ SENSOR NET provides a number of options for integrating the combi output module mechanically and electrically in the system (stacked mounting, distributed mounting, etc.). The various types of installation are described in detail in the INSTALLATION chapter of the system operating manual.

#### 3.2.1 Software requirements of the MIQ/CR3 and IQ SENSOR NET

Software requirements for the use of the *Cleaning* function:

- MIQ/CR3: from version 2.20 up
- Controller: from version 2.20 up

If you use a terminal with a software version from 2.20 up, the *Clean* display flashes. If you use an MIQ/T2020 terminal with a software version lower than 2.20, the *Clean* display does not appear. The measured value display of the sensor flashes.

Software requirements for use of the functions, *PID controller*, *Manual control* and *Fixed current value*:

- MIQ/CR3: from version 2.30 up



#### Note

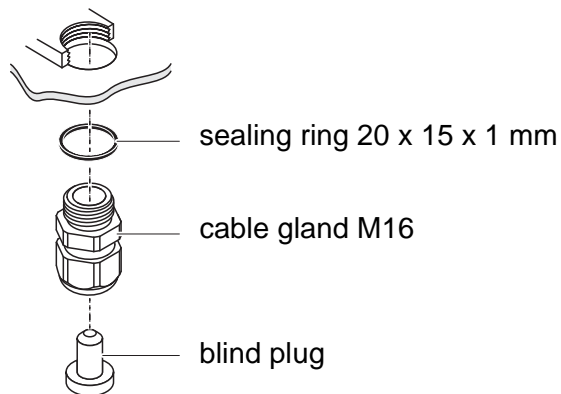
It is possible to update the software if your components have older software versions. Please contact YSI.

### 3.3 Electrical connections: General instructions

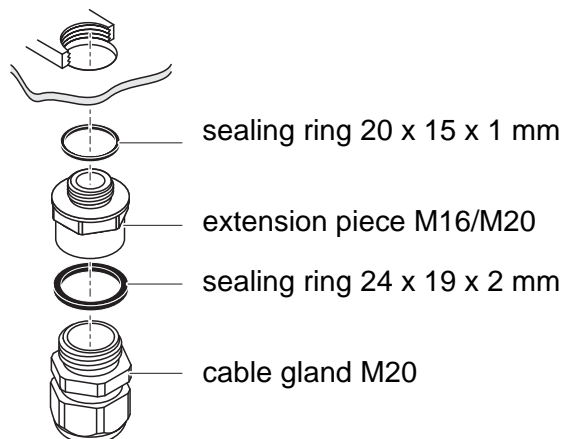
#### Cable glands

All electric cables are fed from below via prepared openings in the enclosure of the module. Cable glands with different clamping ranges are included with the module to provide sealing between the cable and enclosure as well as for strain relief. Select the matching cable gland for the respective cable diameter:

- **Small**, clamping range 4.5 to 10 mm. This cable gland is suitable for all IQ SENSOR NET sensor cables.



- **Large**, clamping range 7 to 13 mm. This cable gland is required for cable sheaths with an outside diameter of more than 10 mm and is screwed into the enclosure via an extension piece.



#### Note

If necessary, you can order more large cable glands in a set of 4 pieces (Model EW/1, Order No. 480 051).

**General installation instructions**

Observe the following points when attaching connecting wires to the terminal strip

- Shorten all wires to be used to the length required for the installation
- Always fit all the ends of the wires with wire end sleeves before connecting them to the terminal strip
- Any wires that are not used and project into the enclosure must be cut off as closely as possible to the cable gland.
- Screw a small cable gland with sealing ring into each remaining free opening and close it with a blind plug.

**Warning**

**No free wires must be allowed to project into the enclosure. Otherwise, there is a danger that areas safe to contact could come into contact with dangerous voltages which could result in life threatening electric shock when working with the IQ SENSOR NET. Always cut off any wires that are not in use as closely as possible to the cable gland.**

### 3.4 Connections to the relay and current outputs



#### Warning

If external electrical circuits that are subject to the danger of physical contact are incorrectly connected to the relay contacts, there may be a danger of life threatening electric shock. Electrical circuits are regarded to be subject to the danger of physical contact when there are voltages higher than the Safety Extra Low Voltage (SELV).

Pay attention to the following points during installation:

- Electrical circuits subject to the danger of physical contact must only be connected by a qualified electrician.
- Electrical circuits subject to the danger of physical contact must only be connected when they are voltage-free.
- If electrical circuits subject to the danger of physical contact are switched with a relay, no circuit that is not subject to this danger (e. g. the MIQ/CHV module) may be operated in the same output module. Use an additional output module for such applications.
- Switching voltages and switching currents on the relay contacts must not exceed the values specified in chapter 6 TECHNICAL DATA. Protect electrical circuits against currents that are too high with an electrical fuse.
- Only single-phase consumers can be switched with the relays. Under no circumstances must multiphase consumers be switched with the aid of several relays (example three-phase current driven pumps). Always switch multiphase consumers via a protective relay.
- After the output module has been installed, it may only be opened if all external voltages have been switched off beforehand.

#### Materials required

- Wire end sleeves, suitable for the connecting wires, with suitable crimping tool
- 4 x screwed cable gland with sealing ring (scope of delivery of the combi output module).

#### Tools

- Cable stripping knife
- Wire stripper
- Phillips screw driver
- Small screw driver

## Connecting lines to the terminal strip

- 1 Open the module.

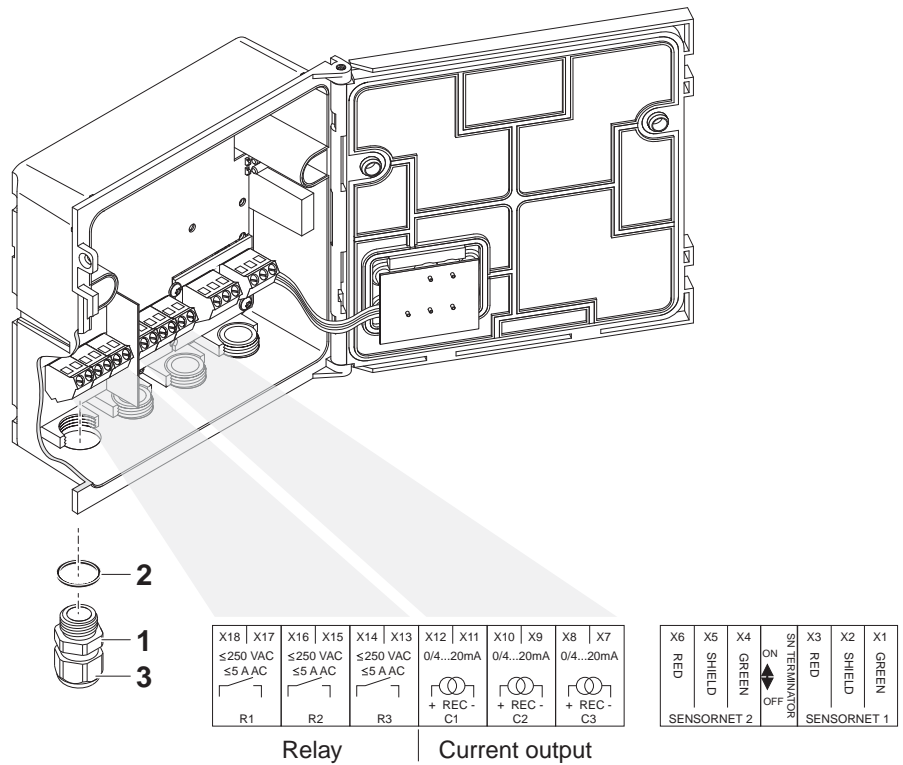


Fig. 3-1 Terminal strip with the relay and current connections

- 2 Screw the cable gland (pos. 1 in Fig. 3-1) with the sealing ring (pos. 2) into the module housing.
- 3 Loosen the coupling ring (pos. 3 in Fig. 3-1).
- 4 Feed the line through the cable gland in the module housing.
- 5 Connect the wires to the terminal strip. While doing so, pay attention to the specifications on the label located under the terminal strip.
- 6 Tighten the coupling ring (pos. 3 in Fig. 3-1).



### Warning

No free wires must be allowed to project into the enclosure. Otherwise, there is a danger that safe areas could come into contact with dangerous voltages. This could result in life threatening electric shock when working with the IQ SENSOR NET. Always cut off any wires that are not in use as closely as possible to the cable gland.

7 | Close the module.

## 4 Settings

The combi output module has three relays outputs and three current outputs.

- Relay outputs operate as openers or closers.
- Current outputs provide a current that depends on the measured value.

On the terminal or Universal Transmitter, you can

- assign names to the outputs (with the 2020 XT system only, see section 4.2).
- link outputs with sensors (see section 4.3)
- delete links of outputs with sensors (see section 4.4)
- adjust outputs (see section 4.5 and section 4.6)
- check the condition of the outputs (see section 4.7)

Basic information on how to use relay outputs is given in section 4.1.



### Note

The general operating principles are given in the relevant system operating manual or in the component operating manual of the terminal components.

### Functions of current and relay outputs

#### Relay output (see section 4.5)

- *System monitoring*
- *Sensor monitoring*
- *Limit indicator*
- *Frequency controller*
- *Pulse-width contr.*
- *Cleaning*
- *Sensor-controlled*
- *Manual control*
- *Alarm contact* (with the 2020 XT system only)

#### Current output (see section 4.6)

- *Recorder*
- *PID controller*
- *Fixed current value*

## 4.1 Basic information on relay functions

In this chapter, you will find general basic information concerning the following relay functions:

- Monitoring (see section 4.1.1)
- Limit indicator (see section 4.1.2)
- Proportional output (see section 4.1.3)

### 4.1.1 Monitoring

When using a relay for monitoring, a relay action (*Open*, *Close*) occurs when certain states occur. This function is suitable, e.g. for the monitoring of errors in the system.



#### Note

For monitoring functions, use the relay preferably as an opener (see section 4.5.1). In the case of an error, the relay opens. As a result, the monitoring function operates even if, e.g. the supply voltage fails.



### 4.1.2 Limit indicator

With a limit indicator, a relay switches when a specified limiting value is exceeded or undercut.

Limit indicators can be used in the following way:

- Monitoring a limiting value using a relay:  
when a limiting value (upper or lower limiting value) is exceeded or undercut, a relay switches. The *Open* or *Close* relay actions are possible in each case (see page 4-4).
- Monitoring two limiting values using two relays:  
If the upper limiting value is exceeded or undercut, a relay switches, and if the lower limiting value is exceeded or undercut, another relay switches. The *Open* or *Close* relay actions are possible in each case (see page 4-4).

**Note**

If the simple monitoring function (*Open*, *Close*) with one or two relays is not sufficient, use proportional output (see section 4.1.3).

**Monitoring limiting values using one or two relays**

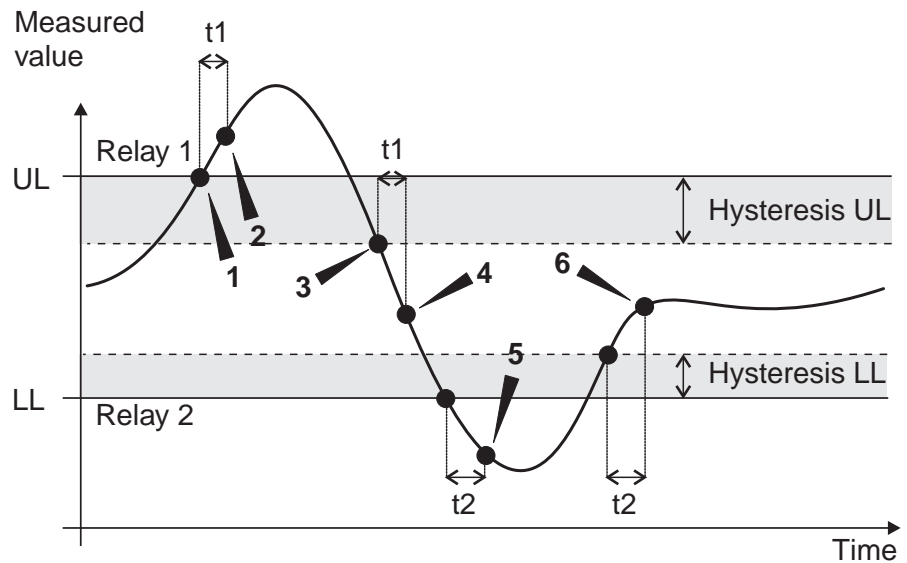


Fig. 4-1 Switching points for relays with the function of a limit indicator

1	Upper limit value (relay 1) exceeded
2	Selected switching delay t1 for relay 1 expired Relay 1 switches
3	Hysteresis for upper limiting value (relay 1) undercut
4	Selected switching delay t1 for relay 1 expired Relay 1 switches back
5	Lower limit value (relay 2) undercut Selected switching delay t2 for relay 2 expired Relay 2 switches
6	Hysteresis for lower limiting value (relay 2) exceeded Selected switching delay t2 for relay 2 expired Relay 2 switches back

A switching delay (t) can be set up for each relay for switching processes. This is the time period for which a limiting value must be exceeded before the relay switches. This prevents frequent switching if the measured values are close to the limiting value.

### 4.1.3 Proportional output

In the case of proportional output, a relay switches cyclically on and off in a defined measured value range (proportional range). At the same time, the relay switches with a:

- duration of operation that corresponds to the measured value (pulse-width output, see page 4-7) or
- switching frequency (frequency output, see page 4-8).

Proportional outputs can be used in the following way:

- Output with one relay:  
An output range is defined with a *Start value* and an *End value*. No output takes place above and below the output range (see page 4-6).
- Output with two relays:  
An output range is defined for each relay with a *Start value* and an *End value*. One relay outputs in the upper output range and a further relay in the lower output range (see page 4-6).

**Output with one relay**

Switching frequency  $f$  or  
Pulse width  $v$

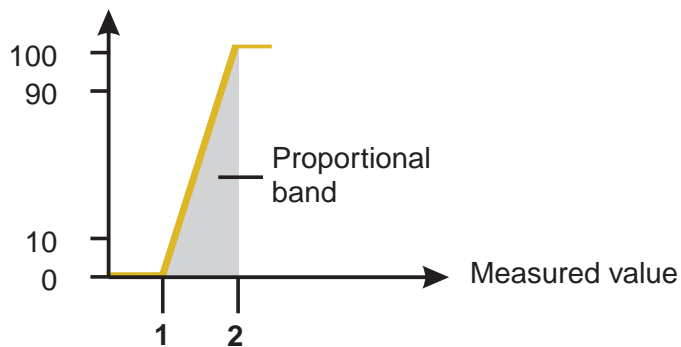


Fig. 4-2 Output with one relay

**Output with two relays**

Switching frequency  $f$  or  
Pulse width  $v$

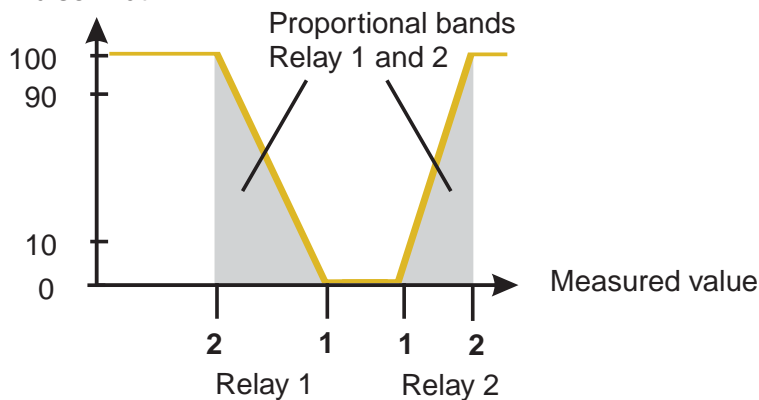


Fig. 4-3 Output with two relays

<b>1</b>	<i>Start value</i> Measured value with a minimum pulse width or switching frequency
<b>2</b>	<i>End value</i> Measured value with a maximum pulse width or switching frequency

### Pulse width output

The output of the pulse width is used, e.g. for controlling valves.

Pulse-width regulation changes the duration of operation ( $t_{on}$ ) of the output signal. Depending on the position of the measured value in the proportional range, the relay is operated for a longer or shorter time period.

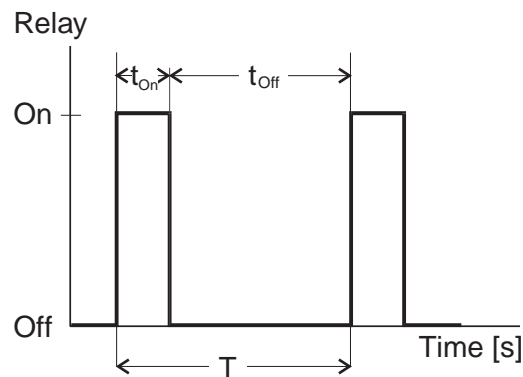


Fig. 4-4 Relay output of the pulse-width output

The cycle duration ( $T$ ) is made up of the turn-on and turn-off switching duration ( $t_{on}$ ,  $t_{off}$ ) of the relay together. While the selected cycle duration ( $T$ ) remains constant, the turn-on duration ( $t_{on}$ ) changes depending on the measured value and, with it, the pulse width ( $v$ ). The pulse width can be set from 0 % to 100 %.

$$v = (t_{on} / T) * 100 \%$$

$v$  = pulse width,  $T$  = cycle duration,  $t_{on}$  = turn-on duration

- If the measured value is at the end of the proportional range (*End value*), the turn-on duration ( $t_{on}$ ) is long, the turn-off duration is short. This means the relay operates for a longer period.
- If the measured value is at the beginning of the proportional range (*Start value*), the turn-on duration ( $t_{on}$ ) is short, and the relay operates for a correspondingly shorter period.



#### Note

If the duration of the closing or opening pulse is shorter than 0.1 s, the relay remains open or closed for the complete cycle duration.

**Frequency output**

Switching frequency output is used, e.g. for controlling dosing pumps.

In contrast to the pulse-width output, not the pulse width is modulated with frequency output but the switching frequency of the output signal. Depending on the position of the measured value in the proportional range, the relay is switched more often or less often.

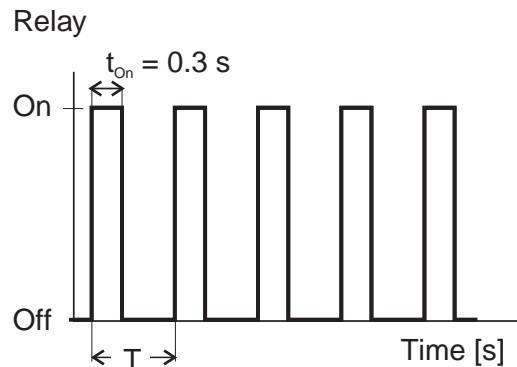


Fig. 4-5 Relay output of frequency output

While the selected switching duration ( $t_{on} = 0.3 \text{ s}$ ) always remains constant, the switching frequency at which the relay switches changes depending on the measured value.

- If the measured value is at the end of the proportional range (*End value*), the switching frequency is higher.
- If the measured value is at the beginning of the proportional range (*Start value*), the switching frequency is low.

### Characteristic curves

Through the selection of the *Start value* and *End value*, the proportional output can be operated with a positive or negative characteristic curve.

- **Positive characteristic curve:**  
Select the *End value* to be greater than the *Start value*.  
The turn-on duration or frequency increases with an increasing measured value (see page 4-10).
- **Negative characteristic curve:**  
Select the *End value* to be smaller than the *Start value*.  
The turn-on duration or frequency decreases with an increasing measured value (see page 4-11).

The maximum values for the pulse width or switching frequency are assigned to the *End value* and the minimum values for turn-on duration or frequency are assigned to the *Start value*.

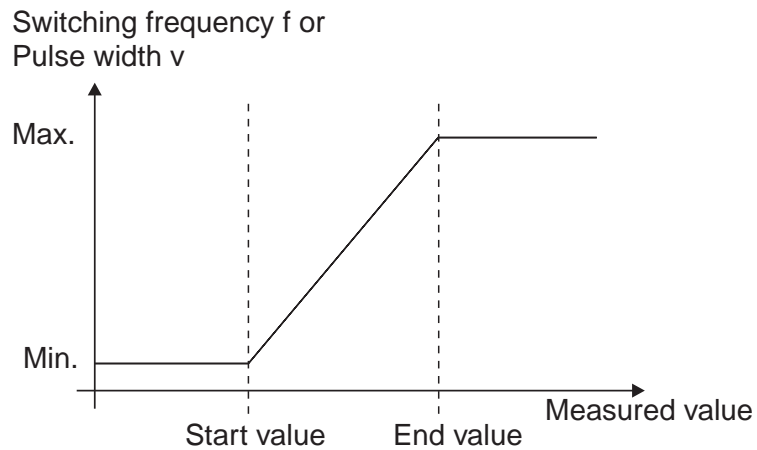


Fig. 4-6 Positive characteristic curve

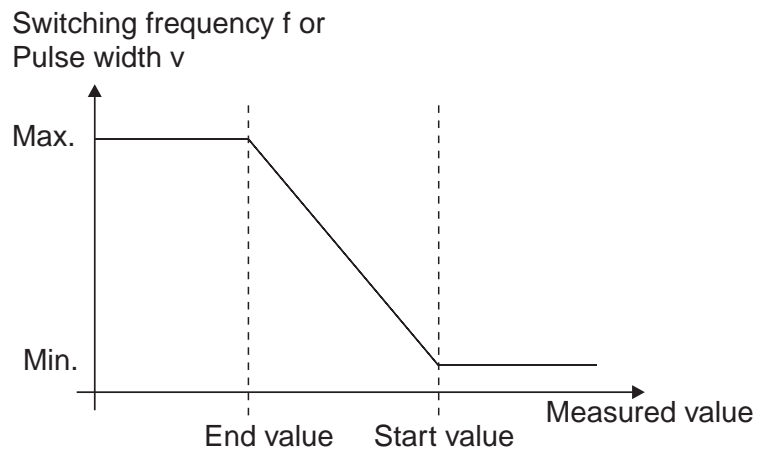


Fig. 4-7 Negative characteristic curve

**Positive characteristic curve**

The proportional output range begins above the initial value. If the proportional range is undercut or exceeded, the selected behavior comes into force.

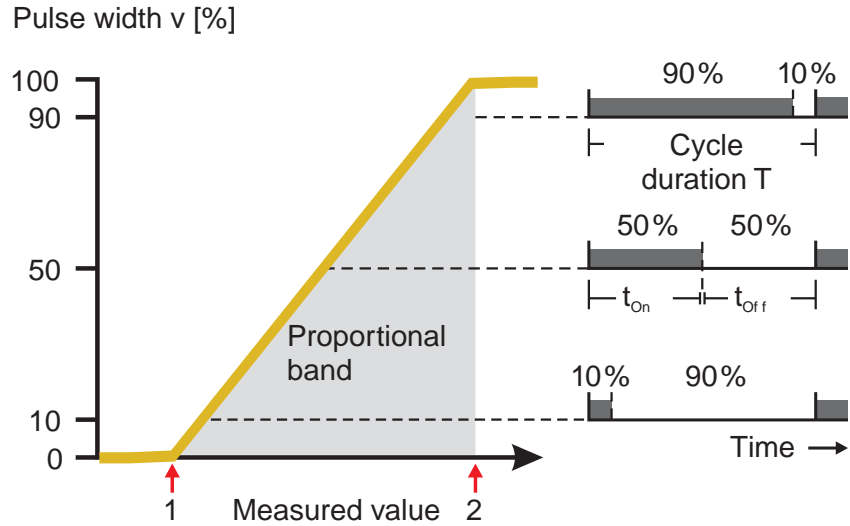


Fig. 4-8 Pulse width output

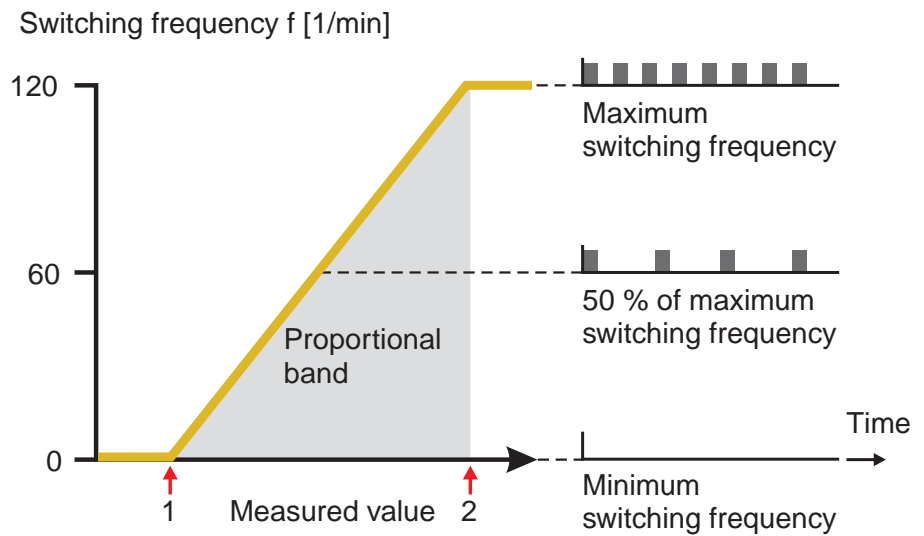


Fig. 4-9 Frequency output

<b>1</b>	<i>Start value</i> Measured value with a minimum pulse width or switching frequency
<b>2</b>	<i>End value</i> Measured value with a maximum pulse width or switching frequency



**Negative characteristic curve**

The proportional output range begins below the initial value. If the proportional range is undercut or exceeded, the selected behavior comes into force.

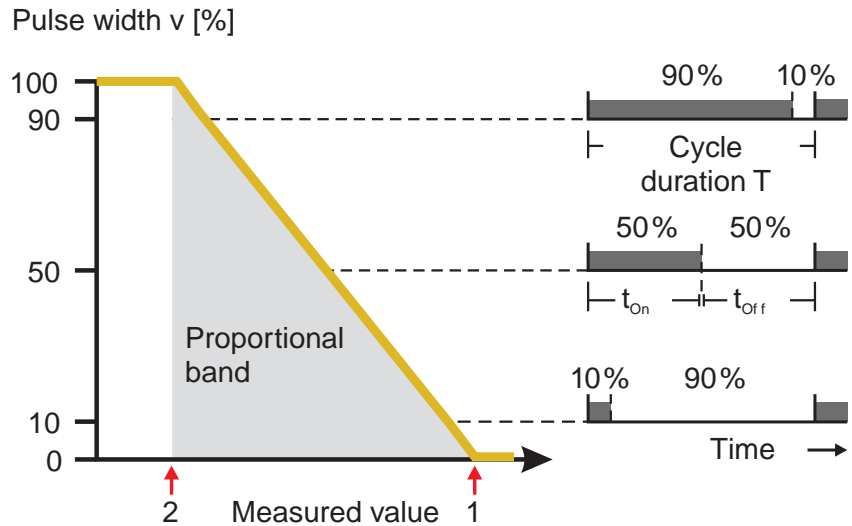


Fig. 4-10 Pulse width output

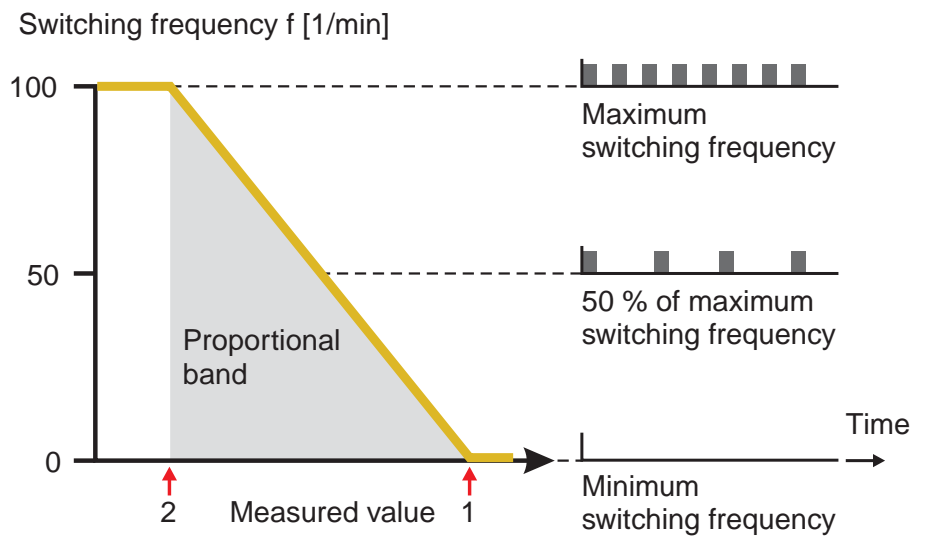


Fig. 4-11 Frequency output

1	<p><i>Start value</i> Measured value with a minimum pulse width or switching frequency</p>
2	<p><i>End value</i> Measured value with a maximum pulse width or switching frequency</p>

## 4.2 Entering / editing the name of an output

For easier identification of the outputs, an individual name can be given to each output in the *Edit list of outputs* overview. This option is available with the 2020 XT system only.

1	Open the <i>Settings</i> menu with <b>S</b> .
2	Using <b>↻</b> and <b>OK</b> , select and confirm the menu item, <i>System settings</i> -> <i>Edit list of outputs</i> . The <i>Edit list of outputs</i> display opens.
3	Highlight a name in the <i>Name</i> column with <b>↻</b> and confirm with <b>OK</b> .








Terminal 1	15 May 2001	14:53			
Edit list of outputs					130
No.	Model/Channel	Ser. no.	Name		
D01	MIQ/CR3/C1	12345678	02		
D01	MIQ/CR3/C2	12345678	02-Belebung		
D01	MIQ/CR3/C3	12345678	02-Belebung		
D01	MIQ/CR3/R1	12345678	GW Lüfter I		
D01	MIQ/CR3/R2	12345678	GW Lüft II		
D01	MIQ/CR3/R3	12345678	GW Lüft III		
?02	MIQ/CR3/R1	22222222	GW1 Trübung		
?02	MIQ/CR3/R2	22222222	GW2 Trübung		
D03	MIQ/CR3/C1	66666666	Schlammzgl		
D03	MIQ/CR3/C2	66666666	Trüb Abl		
D03	MIQ/CR3/R1	66666666	Trüb Zul		
Select character <b>↻</b> , confirm character <b>OK</b>					

Fig. 4-12 130 - Edit list of outputs

4	Select a letter, a numeral or a special character with <b>↻</b> and confirm with <b>OK</b> .
5	Complete the name of the output and confirm with <b>OK</b> .

### 4.3 Linking the output with a sensor

The following steps describe operation with the 2020 XT system. With the System 182 XT, the outputs of the DIQ/CR3 can be found directly under the *Settings* menu (see system operating manual of the DIQ/S 182 XT).

- 1 Open the *Settings* menu with .
- 2 Using  and , select and confirm the menu item, *System settings* -> *Settings of outputs and links*. The *Settings of outputs and links* display opens.
- 3 Highlight the column with  and confirm with .
- 4 Highlight an output with  and confirm with . The *Link with...* display opens. The display shows a list of the sensors to which a link is possible.

Terminal 1		01 Jan 2001 00 00		🔒 ⚠️ ⓘ	
Link with...					
No.	Sensor name	Measuring range			
S01	01341000	02	0.0 ... 60.0 mg/L		
S03	99160001	pH	0..14		





Select sensor , confirm 

Fig. 4-13 150 - Settings of outputs and links:Link with...

- 5 Select a sensor with  and confirm with . The output is linked with the selected sensor.



#### Note

Outputs that are linked with sensors can be identified in the *Ser. no.* field of the *Settings of outputs and links* overview by the specification of the linked sensor.

### 4.4 Deleting a link with an output

If a link from a current or relay output with a sensor is no longer required, the link can be deleted.

The following steps describe operation with the 2020 XT system. With the System 182 XT, the outputs of the DIQ/CR3 can be found directly under the *Settings* menu (see system operating manual of the DIQ/S 182 XT).

- 1 Open the *Settings* menu with **S**.
- 2 Using **⏪** and **OK**, select and confirm the menu item, *System settings* -> *Settings of outputs and links*. The *Settings of outputs and links* display opens.
- 3 Highlight the column **&** with **⏪** and confirm with **OK**.
- 4 Highlight a linked output with **⏪** and confirm with **OK**.

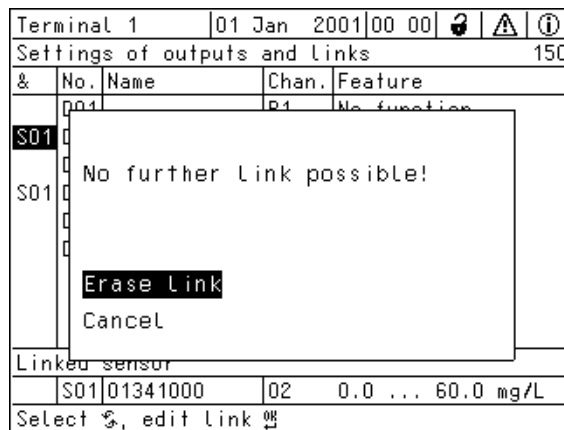


Fig. 4-14 150 - Settings of outputs and links:Erase link

- 5 Select *Erase link* with **⏪** and confirm with **OK**. A security prompt appears.
- 6 Select *Erase link* with **⏪** and confirm with **OK**. The link is deleted.

## 4.5 Setting the relay outputs

The following steps describe operation with the 2020 XT system. With the System 182 XT, the outputs of the DIQ/CR3 can be found directly under the *Settings* menu (see system operating manual of the DIQ/S 182 XT).

1	Call up the measured value display with <b>(M)</b> .
2	Open the <i>Settings</i> menu with <b>(S)</b> .
3	Highlight the <i>Settings of outputs and links</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>Settings of outputs and links</i> display appears.
4	Highlight the <i>Feature</i> column with <b>(↻)</b> and confirm with <b>(OK)</b> .
5	Highlight a line for a relay output (Rx) in the <i>Feature</i> column with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>Settings of outputs and links</i> display opens.
6	Highlight the <i>Relay function</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> .

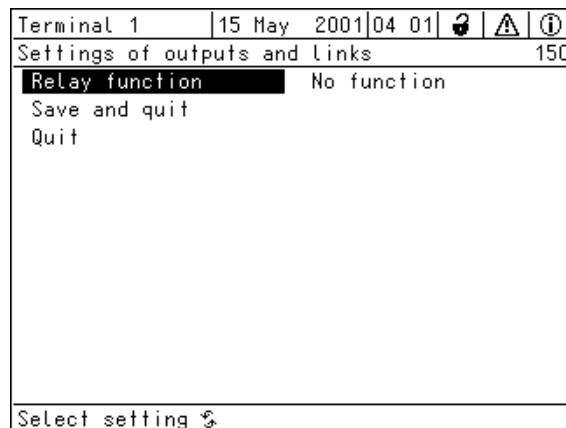






Fig. 4-15 150 - Settings of outputs and links

7	Select one of the functions in the following list with <b>(↻)</b> and confirm with <b>(OK)</b> .
---	--

Function	Description
<i>No function</i>	The relay output is not used.
<i>System monitoring</i>	see section 4.5.2
<i>Sensor monitoring</i>	see section 4.5.3
<i>Limit indicator</i>	see section 4.5.4
<i>Frequency controller</i>	see section 4.5.5
<i>Pulse-width contr.</i>	see section 4.5.6
<i>Cleaning</i>	see section 4.5.7
<i>Sensor-controlled</i>	see section 4.5.8
<i>Manual control</i>	see section 4.5.9
<i>Alarm contact</i>	see section 4.5.10

- 8 Carry out the settings for the relay outputs with  and . The settings include the relay action (see section 4.5.1) and sensor-dependent settings.
- 9 Highlight and confirm *Save and quit* with  and . The new settings are stored.

As soon as a function is selected for a relay output, a relay action can be selected (see section 4.5.1).

#### 4.5.1 Relay action

The following actions of the relay can be laid down in the *Action* setting:

Settings	Explanations
<i>Open</i>	The relay should open if any event occurs.
<i>Close</i>	The relay should close if any event occurs.



**Note**

Preferably set up the relay output as normally closed for monitoring functions (*Action Open*).

#### 4.5.2 System monitoring

**Function** The *System monitoring* enables to monitor system errors.

In order to set up the *System monitoring* function for a relay output, the relay output must not be linked with a sensor (see section 4.3).

It can be used to monitor the following system errors.

Settings	Settings	Selection	Explanations
	<i>Power failure</i>	<i>On</i> <i>Off</i>	The <i>Power failure On</i> function monitors the supply voltage in the IQ SENSOR NET on the combi output module. If the voltage falls below the critical value, the relay switches.
	<i>Communication</i>	<i>On</i> <i>Off</i>	The <i>Communication On</i> function monitors the functioning of the controller and the communication to the combi output module.
	<i>Collective error message</i>	<i>On</i> <i>Off</i>	The <i>Collective error message On</i> function simultaneously monitors the proper functioning of all sensors and the functioning of the monitoring combi output module. (for details see below this table)
	<i>Action</i>	<i>Open</i>	For all functions of the <i>System monitoring</i> , the relay action is set to <i>Open</i> .

#### Collective error message

In the case of a *Collective error* message, the relay opens if one of the following malfunctions occurs:

- One of the sensors properly registered at the controller does not supply a valid main measured value
- One of the sensors properly registered at the controller does not supply a valid secondary measured value
- The monitoring combi output module has not received any new data from the controller for two minutes.

In any case, the relay remains open for 10 seconds and only closes when the malfunction is no longer present.

In the following cases, the relay does not open despite an invalid measured value:

- The sensor is being calibrated
- The sensor is in the maintenance condition
- The sensor is being cleaned with the aid of a valve module in the system (compressed air operated cleaning system).

#### 4.5.3 *Sensor monitoring*

##### Function

The *Sensor monitoring* function enables to monitor sensor errors and the maintenance condition.

In order to set up the *Sensor monitoring* function for a relay output, the relay output must be linked with a sensor (see section 4.3).

##### Settings

Setting	Selection	Explanation
<i>Errors</i>	<i>Special</i>	Special sensor errors are monitored and can prompt a relay action.
	<i>All</i>	All sensor errors (special ones and general ones) are monitored and can prompt a relay action.
	<i>Off</i>	Sensor errors are not monitored.
<i>Mainten. Condition</i>	<i>On</i>	Switching on and off the maintenance condition (see section 4.9) is monitored and can prompt a relay action.
	<i>Off</i>	
<i>Action</i>	<i>Open</i>	Relay action (see section 4.5.1)
	<i>Close</i>	



##### Note

Preferably set up the relay output as opener for monitoring functions (*Action Open*, see section 4.5.1).

Sensor messages include errors and information that are registered by the sensor.

##### Special sensor errors

The special sensor errors are sensor-dependent. Details of this are given in the component operating manual of the respective sensor.



<b>General sensor errors</b>	<i>Init</i>	can prompt a relay action for a short time, depending on the starting behavior of the system
	----	Invalid measured value, or defective sensor
	<i>Error</i>	Communication with sensor interrupted
	<i>OFL</i>	Measuring range undercut or exceeded (overflow)

#### 4.5.4 Limit indicator

**Function** The characteristic of the limit indicator is laid down in the *Limit value UL*, *Limit value LL*, *Hysteresis UL* and *Hysteresis LL* settings. The fundamentals of the function are described in the introductory chapter (see section 4.1.2).

In order to set up the *Limit indicator* function for a relay output, the relay output must be linked with a sensor (see section 4.3).

<b>Settings</b>	<b>Setting</b>	<b>Selection/Values</b>	<b>Explanation</b>
	<i>Limit values</i>	<i>UL main variable</i> <i>LL main variable</i>  <i>UL adjoining var.</i> <i>LL adjoining var.</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Limit value UL</i> <i>Limit value LL</i>	<i>Any upper and lower limiting value within the measuring range (sensor-dependent)</i>	Minimum spacing between the upper and lower limiting value: 5 % of the measuring range
	<i>Hysteresis UL</i> <i>Hysteresis LL</i>	<i>0 - 5% of the measuring range</i>	Hysteresis for <i>Limit value UL</i> and <i>Limit value LL</i> .

<b>Setting</b>	<b>Selection/Values</b>	<b>Explanation</b>
<i>Behavior at error</i>	<i>Open</i> <i>Close</i> <i>Unchanged</i>	The relay opens, closes, or remains unchanged in case of system errors or sensor errors (see page 4-39).
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 4.5.1)
<i>Switching delay</i>	<i>0 ... 3600 s</i>	The time period for which a limiting value must be exceeded before the relay operates. Prevents frequent switching for measured values that are close to the limiting value.

#### 4.5.5 Frequency controller

**Function** The characteristic of the frequency output is laid down in the *Start value*, *End value*, *Frequency (f) min.* and *Frequency (f) max.* settings. The fundamentals of the function are described in the introductory chapter (see section 4.1.3).

In order to set up the *Frequency controller* function for a relay output, the relay output must be linked with a sensor (see section 4.3).

Settings	Setting	Selection/Values	Explanation
	<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Start value</i>	<i>within the measuring range (sensor-dependent)</i>	Minimum spacing: 5 % of the measuring range
	<i>End value</i>		
	<i>Frequency (f) min.</i>	<i>0 to 120 1/min</i>	Minimum spacing: 10 1/min
	<i>Frequency (f) max.</i>		
	<i>Frequency with error</i>	<i>0 to 120 1/min</i>	In case of system errors or sensor errors (see page 4-39), the relay switches with the frequency specified.
	<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 4.5.1)

**Characteristic curve** If a value is entered for *End value* that is greater than the *Start value*, the output has a positive characteristic curve.

In order to obtain a negative characteristic curve, a value must be entered for *End value* that is smaller than the value for *Start value*.

#### 4.5.6 Pulse-width contr.

##### Function

The characteristic of the pulse width output is laid down in the *Start value*, *End value*, *Pulse width (v) min.* and *Pulse width (v) max.* settings. The fundamentals of the function are described in the introductory chapter (see section 4.1.3).

In order to set up the *Pulse-width contr.* function for a relay output, the relay output must be linked with a sensor (see section 4.3).

##### Settings

Setting	Selection/Values	Explanation
<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
<i>Start value</i>	<i>within the measuring range (sensor-dependent)</i>	Minimum spacing: 5 % of the measuring range
<i>End value</i>		
<i>Pulse width (v) min.</i>	0 ... 100 %	Minimum spacing: 10 % of the <i>Cycle duration (T)</i>
<i>Pulse width (v) max.</i>		
<i>Cycle duration (T)</i>	5 ... 100 s	Length of the switching period T $T = (t_{on} + t_{off})$
<i>Error pulse width</i>	0 ... 100 %	In case of system errors or sensor errors (see page 4-39), the relay switches with the pulse-width specified.
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 4.5.1)

##### Characteristic curve

You can specify the minimum and maximum pulse width (v). This determines the steepness of the characteristic curve of the output.

#### 4.5.7 Cleaning

**Note**

When using the MIQ/CHV PLUS valve module, it is best to set the *Cleaning* function directly at the valve output (V) of the MIQ/CHV PLUS (see operating manual of the MIQ/CHV PLUS). The relay can then be used for other purposes.

**Function**

The *Cleaning* function enables the time controlled automatic start of the sensor cleaning function with the aid of a relay of the combi output module.

The relay controls the MIQ/CHV valve module and switches on or off the compressed air for the CH sensor cleaning head.

In order to set up the *Cleaning* function for a relay output, the relay output must be linked with a sensor (see section 4.3).

The relay assigned to the combi output module always works as a closer.

The cleaning cycle consists of *Cleaning duration* and *Adjustment time*.

During the cleaning cycle the *Clean* display flashes. The outputs linked with this sensor are frozen. The maintenance condition (see section 4.9) is active.

After the *Cleaning duration*, the relay is opened. During the following *Adjustment time* the outputs remain blocked.

The outputs linked with this sensor are only released when the cleaning cycle is completed. The *Clean* display disappears. The maintenance condition is finished.

**Testing the operativeness**

You can test the operativeness of the cleaning system as follows: manually open or close the relay with the *Manual control* function (see section 4.5.9) and, while doing so, check the behavior of the cleaning system.

Alternatively, you can test the operativeness of the cleaning system by checking the performance of the function at the start time set up (reference time  $\pm$  interval). To perform a test immediately, you can set the reference time so that the next cleaning will start in a few minutes (settings: see following table).

Settings	Setting	Selection/Values	Explanation
	<i>Reference time (h)</i>	0 ... 23 h	Time at which a cleaning cycle is started. Further cleaning cycles will be performed at the times specified by the cleaning interval.
	<i>Reference time (min)</i>	0 ... 60 min	
	<i>Interval unit</i>	1 .. 7 d 1 .. 24 h 5 .. 60 min	Selection of range and unit for the <i>Cleaning interval</i> .
	<i>Cleaning interval</i>	1/2/3/4/5/6/7 d  or: 1/2/3/4/6/8/12/24 h  or: 5/10/15/20/30/60 min	Repeat interval for the cleaning function: Time between the start time of a cleaning cycle and the start time of the next cleaning cycle*.
	<i>Cleaning duration</i>	0 ... 300 s	Duration of the cleaning
	<i>Adjustment time</i>	0 ... 900 s	Time extension to allow the sensor to adjust to the test sample after the cleaning.

\* With short *cleaning intervals*, the adjustable values for the *Cleaning duration* and *Adjustment time* are limited. The following values apply:

<i>Cleaning interval</i>	<i>Cleaning duration</i>	<i>Adjustment time</i>
≤ 10 min	max. 60 s	max. 120 s
≤ 20 min	max. 180 s	max. 300 s



#### Note

With this, the cleaning times are fixed. They only change when the *reference time* is changed.



#### Note

The reference time and all further cleaning times relate to the date and time of the system clock. How to set the system clock is described in the system operating manual.

Example	Setting	Result
	Reference time (h): 12	Reference time: 12:00 hours
	Reference time (min): 0	This specifies the following start times:
	Interval unit: Hours (h) 8 h	04:00, 12:00 and 20:00 hours
	Cleaning interval:	

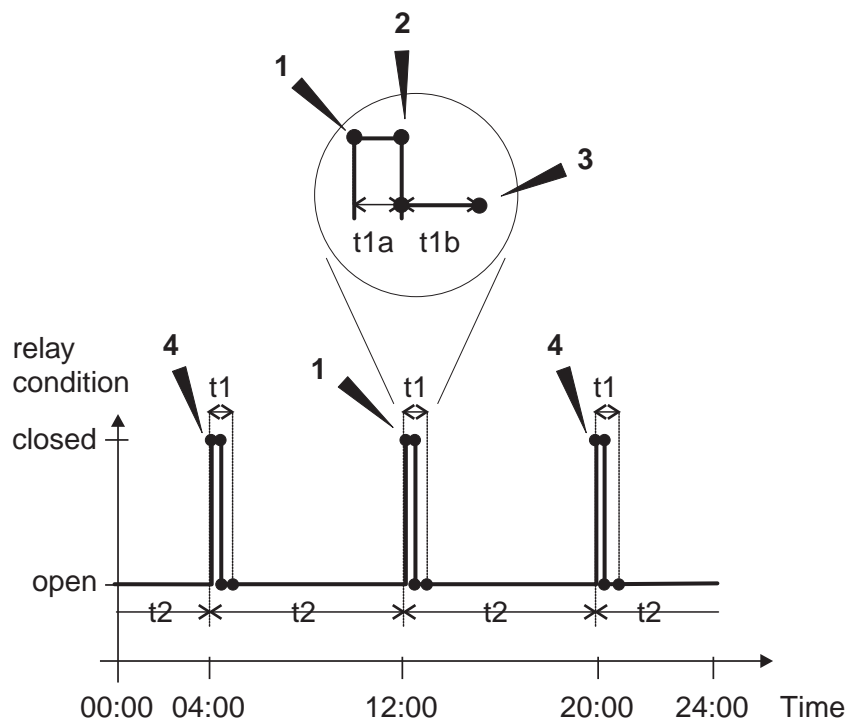



Fig. 4-16 Cleaning cycle

1	Reference time Start of a cleaning cycle (t1) Start of the specified <i>Cleaning duration</i> (t1a)
2	End of the specified <i>Cleaning duration</i> (t1a) Start of the specified <i>Adjustment time</i> (t1b)
3	End of the specified <i>Adjustment time</i> (t1b) End of the cleaning cycle (t1)
4	Reference time ± <i>Cleaning interval</i> (t2) Start of a cleaning cycle
t1	Cleaning cycle = <i>Cleaning duration</i> (t1a) <i>Adjustment time</i> (t1b) Linked outputs are frozen.
t2	<i>Cleaning interval</i>

## Canceling the cleaning

A running cleaning cycle is canceled:

- Automatically
  - If the sensor switches to the inactive condition during the cleaning cycle
- Manually
  - By pressing 
  - By switching on the maintenance condition

Each time the cleaning cycle is canceled, the relay opens immediately.

If the cleaning cycle is canceled automatically, the outputs linked to the sensor are released immediately.

If the cleaning cycle is canceled manually, the sensor is in the maintenance condition. The linked outputs are only released after the maintenance condition was terminated manually.

The next cleaning cycle will be performed at the time set up.



### Note

In case of a power failure, all relays open. The cleaning cycle is canceled. The outputs linked with the sensor change to the non-active condition (see section 4.8.2). As soon as the power is available, the outputs are released again. The next cleaning cycle will be performed at the time set up.



#### 4.5.8 *Sensor-controlled*

With the *Sensor-controlled* function, the relay is controlled by a linked sensor.

#### Requirements

- For the 2020 XT system, a controller with a software version from 2.80 up is required
- Sensor that transmits signals to trigger a cleaning cycle, e.g. UV/VIS sensor

#### Settings

Setting	Selection/Values	Explanation
<i>Pulse length</i>	<i>Automatic</i>	The duration of the air cleaning process is programmed in the sensor. The relay automatically takes over the cleaning duration from the sensor.
	0,5 s	The relay finishes the cleaning after the selected interval.
	1 s	
	2 s	
	3 s	



#### Note

Settings of the cleaning process can be done in the *Settings of sensors and diff. sensors* menu of the respective sensor.

**4.5.9 Manual control**

**Function**

With the *Manual control* function, you can test the operativeness of an instrument that is connected to the relay. To do so, close or open the relay manually and, while doing so, check the behavior of the connected instrument.

Setting	Selection/Values	Explanation
<i>Relay function</i>	<i>Manual control</i>	The selected relay action is carried out with <i>Save and quit</i> .
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 4.5.1)



**Note**

The settings for other functions in the *Relay function* menu, as for example *Frequency controller* and *Pulse-width contr.*, are retained while the *Manual control* is carried out.

**4.5.10 Alarm contact**



**Note**

The *Alarm contact* function is only effective with systems with alarm function (System 2020 XT).

**Function**

The *Alarm contact* function triggers a relay action (close or open) if a specified alarm event occurs. The *Alarm contact* function is only available for relays that are not linked with a sensor. If necessary, an existing link has to be deleted.

Setting	Selection/Values	Explanation
<i>Relay function</i>	<i>Alarm contact</i>	The selected relay action is carried out with <i>Save and quit</i> .
<i>Action</i>	<i>Open</i> <i>Close</i>	Relay action (see section 4.5.1)



**Note**

The setting up of alarms is described in the IQ SENSOR NET system operating manual. Other possibilities of how to use the alarm function are described there as well.

## 4.6 Setting of current outputs

The following steps describe operation with the 2020 XT system. With the System 182 XT, the outputs of the DIQ/CR3 can be found directly under the *Settings* menu (see system operating manual of the DIQ/S 182 XT).

1	Call up the measured value display with <b>(M)</b> .
2	Open the <i>Settings</i> menu with <b>(S)</b> .
3	Highlight the <i>Settings of outputs and links</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>Settings of outputs and links</i> display appears.
4	Highlight the <i>Feature</i> column with <b>(↻)</b> and confirm with <b>(OK)</b> .
5	Highlight a line for a current output (Cx) in the <i>Feature</i> column with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>Settings of outputs and links</i> display opens.
6	Highlight the <i>Current output</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> .

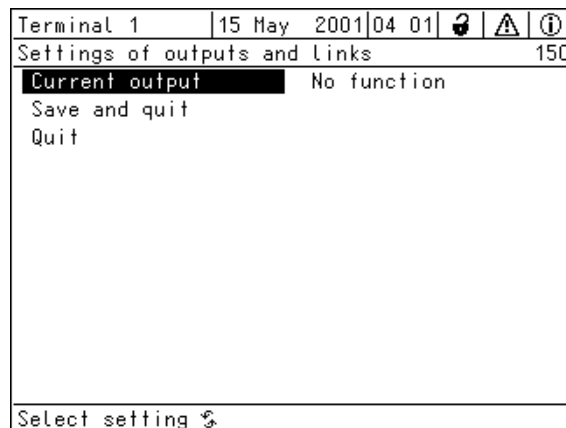






Fig. 4-17 150 - Settings of outputs and links

7	Select a function with <b>(↻)</b> and confirm with <b>(OK)</b> .
---	--

Function	Settings
<i>No function</i>	The current output is not used.
<i>Recorder</i>	see section 4.6.1
<i>PID controller</i>	see section 4.6.2
<i>Fixed current value</i>	see section 4.6.3

8	Carry out the settings for the current output with  and  .
9	Highlight and confirm <i>Save and quit</i> with  and  . The new settings are stored.

#### 4.6.1 Recorder

**Function** The measured values of the linked sensor at the current output are set up as current intensity in the *Recorder* application. The output of measured values is laid down in the *Recorder type*, *Start value* and *End value* settings.

Setting	Selection/Values	Explanation
<i>Recorder type</i>	<i>0 to 20 mA or 4 to 20 mA</i>	
<i>Start value</i> <i>End value</i>	<i>within the measuring range (sensor- dependent)</i>	Minimum spacing: 5 % of the measuring range
<i>Measured variable</i>	<i>Main variable Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
<i>Attenuation</i>	<i>0 ... 40 mA/s</i>	Speed of change of the output current (mA/s) in the case of an erratic change of the input signal.

<i>I -&gt; OFL/UFL</i>	<i>Error</i>	Current values outside the range between <i>Start value</i> and <i>End value</i> are considered as errors. The current output reacts as specified under <i>Behavior at error</i> (see below).
	<i>Limitation</i>	The current at the output is limited to the <i>Start value</i> or <i>End value</i> .
<i>Behavior at error</i>	<i>Fixed current value</i>	In case of system errors and sensor errors, and in case of measured values outside the range between <i>Start value</i> and <i>End value</i> , the current output supplies the specified fixed current value. Possible values: 0 ... 21 mA.
	<i>Unchanged</i>	The current at the output remains unchanged.

#### 4.6.2 PID controller

**Function** With the *PID controller* function, you can use an output as a controller output. The controller can be configured as a **P**roportional controller with a switchable **I**ntegral and **D**erivative controller part (**PID** controller).

The control mode of the PID controller is described by the following equation:

$$I_{Controller} = I_0 + K \left( x_e + \frac{I}{T_i} \int x_e dt + T_d \frac{dx_e}{dt} \right)$$

with:

$$K = \frac{I_{max} - I_{min}}{X_p}$$

$$x_e = x_{nom} - x_{actual}$$

$$I_{min} \leq I_{Controller} \leq I_{max}$$

$I_{Controller}$	Current at the controller output at time t
$I_0$	Current at output if $x_{actual} = x_{nominal}$
$K$	Gain
$X_p$	Proportional band
$x_e$	Error signal
$x_{actual}$	Actual value (current measured value)
$x_{nom}$	Nominal value
$t_i$	Integral control part
$t_d$	Derivative control part
$t$	Time
$I_{min}$	Lower current limitation
$I_{max}$	Upper current limitation

The adjustable control parameters are  $x_{nominal}$ ,  $I_0$ ,  $X_p$ ,  $I_{min}$ ,  $I_{max}$ ,  $t_i$  and  $T_d$  (see setting table on page 4-35).

By activating or deactivating the **Integral** ( $ti$ ) and **Derivative** ( $td$ ) controller part, the following controller types can be configured:

Controller type	$td$ [s]	$ti$ [s]
P controller	0	0
PI controller	0	1 to 9999
PD controller	1 to 9999	0
PID controller	1 to 9999	1 to 9999

### Characteristic curve of the proportional controller

For a P controller, the interrelationship between the measured value and current  $I$  at the controller output forms the following characteristic curve:

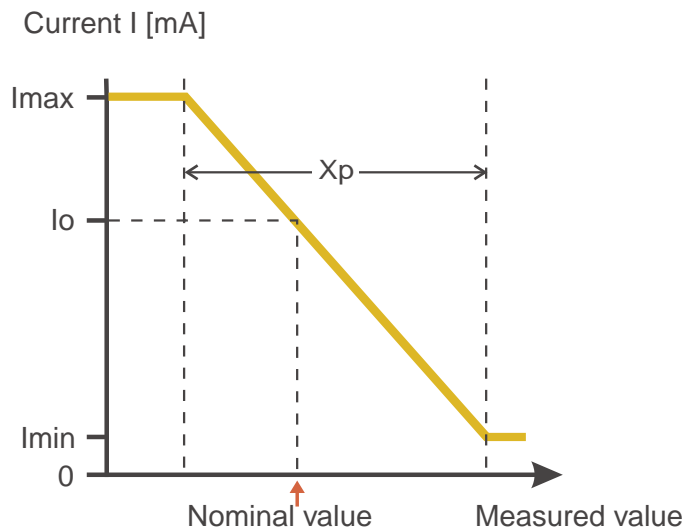


Fig. 4-18 Proportional controller (negative characteristic curve)

The proportional band  $X_p$  is limited by the measuring range of the linked sensor. If a value is entered for the parameter  $X_p$  that is greater than zero, the controller has a negative characteristic curve (example Fig. 4-18). To obtain a positive characteristic curve, a negative value must be entered for  $X_p$ .

**Application example**

- Feedback control of the D. O. concentration
- Sensor: TriOxmatic 700 IQ (measuring range: 0 ... 60 mg/l)

Control parameters	Value
Nominal value	4 mg/l
$X_p$	10 % of the measuring range or 6 mg/l
$I_{min}$	8 mA
$I_{max}$	14 mA
$I_o$	12 mA
$t_i$	0 s (no I controller part)
$t_d$	0 s (no D controller part)

The control parameters form the following (negative) characteristic curve:

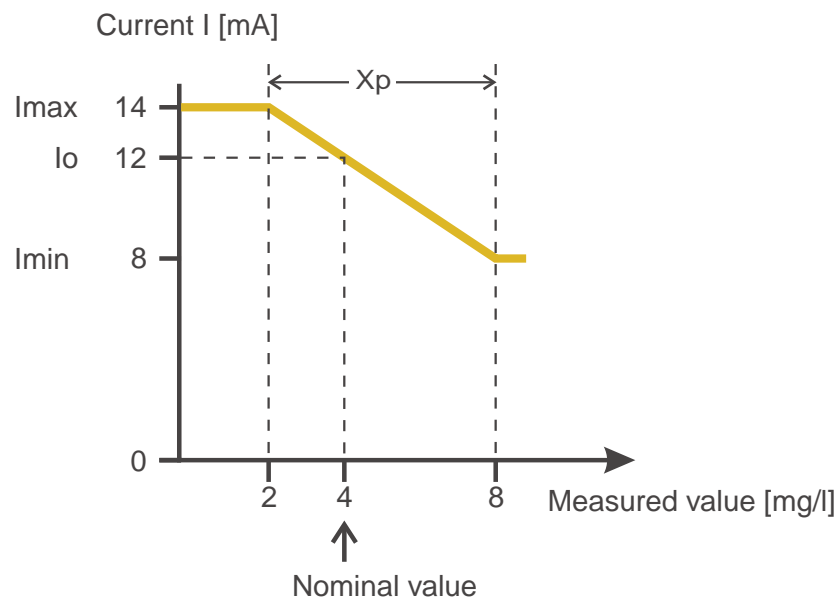


Fig. 4-19 Characteristic curve for application example

The controller works with the following gain:

$$K = \frac{6 \text{ mA}}{6 \text{ mg/l}} = 1 \frac{\text{mA}}{\text{mg/l}}$$



Within the proportional band, a concentration increase by 1 mg/l causes a decrease of the current output by 1 mA. If, for example, the measured concentration is 5 mg/l, 11 mA are output:

$$I_{\text{Controller}} = 12 \text{ mA} + 1 \frac{\text{mA}}{\text{mg/l}} \cdot (4 \text{ mg/l} - 5 \text{ mg/l})$$

$$I_{\text{Controller}} = 12 \text{ mA} + 1 \frac{\text{mA}}{\text{mg/l}} \cdot (-1 \text{ mg/l}) = 11 \text{ mA}$$

The highest concentration with which the controller works within the proportional band is 8 mg/l (corresponding to  $I_{\text{min}} = 8 \text{ mA}$ ), the lowest one is 2 mg/l (corresponding to  $I_{\text{max}} = 14 \text{ mA}$ ).

Settings	Setting	Selection/Values	Explanation
	<i>Measured variable</i>	<i>Main variable</i> <i>Adjoining variable</i>	<i>Main variable</i> designates the actual measured parameter of the sensor (e.g. pH, oxygen, etc.). <i>Adjoining variable</i> designates an additional measured parameter (e.g. temperature).
	<i>Nominal value</i>	<i>within the measuring range (sensor-dependent)</i>	Nominal value the measured value is regulated to
	<i>Xp</i>	<i>5 ... 100 %</i> <i>-5 ... -100 %</i> <i>of the measuring range</i>	Proportional band of the controller. Negative values result in a positive characteristic curve.
	<i>Imin</i>	<i>0 ... 20 mA</i>	Lower current limitation *
	<i>Imax</i>	<i>0 ... 20 mA</i>	Upper current limitation *  * Note: Spacing between <i>Imin</i> and <i>Imax</i> : at least 5 mA

Setting	Selection/Values	Explanation
<i>lo</i>	<i>0 ... 20 mA</i>	Current value on the output if the measured value equals the <i>Nominal value</i>
<i>ti</i>	<i>0 ... 9999 s</i>	Hold-back time: Integral part of the controller ( <i>0</i> = not effective)
<i>td</i>	<i>0 ... 9999 s</i>	Reset time: Derivative part of the controller ( <i>0</i> = not effective)
<i>Behavior at error</i>	<i>Fixed current value</i>	In the case of an error, the current output supplies the current value defined in the <i>Current with error</i> field (any in the range <i>0 ... 21 mA</i> ).
	<i>Unchanged</i>	In the case of an error, the current on the output remains unchanged.

### 4.6.3 Fixed current value

#### Function

With the *Fixed current value* function, you can test the operativeness of the instruments connected to the outputs: output different current values to the output and, while doing so, check the behavior of the connected instrument.

Setting	Selection/Values	Explanation
<i>Current output</i>	<i>Fixed current value</i>	Using <i>Save and quit</i> , the nominal amperage that was input as <i>Inom</i> is output.
<i>Inom</i>	<i>0 ... 20 mA</i>	The nominal amperage that is output.



#### Note

The settings for other functions in the *Current output* menu, as for example *PID controller* and *Recorder*, are retained while the *Fixed current value* is carried out.

## 4.7 Checking the status of the outputs

This function offers a simple overview of the states of all outputs of the combi output module.

For relays, the status *open* or *closed* is displayed.

For current outputs, the current value available at the output is displayed.

With the System 182 XT, you can recall the states of the outputs via the measured value and status display (see system operating manual of the DIQ/S 182 XT).

With the 2020 XT system, the function, *394 - Status of output channels*, in the menu, *Settings/Service/List of all components* can be accessed as follows:

1	Call up the measured value display with <b>(M)</b> .
2	Open the <i>Settings</i> menu with <b>(S)</b> .
3	Highlight the <i>Service</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>Service</i> dialog box opens.
4	Highlight the <i>List of all components</i> menu item with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>List of all components</i> dialog box opens.
5	Select the required component (column <i>Model</i> , entry <i>MIQCR3</i> ) with <b>(↻)</b> and confirm with <b>(OK)</b> . The <i>394 - Status of output channels</i> window opens.

Terminal PC	15 May 2001	14 53			
Status of output channels					394
No.	Name	Chan.	Status		
001	GW Lüfter I	R1	closed		
001	GW Lüft II	R2	closed		
001	GW Lüft III	R3	open		
001	02-Belebung	C1	14.12 mA		
001	02-Belebung	C2			
001	02-Belebung	C3	6.65 mA		
Return ESC					

Fig. 4-20 394 - Status of output channels

6	Using <b>(M)</b> or <b>(ESC)</b> , exit the <i>394 - Status of output channels</i> window.
---	--

## 4.8 Behavior of linked outputs

### 4.8.1 Behavior in case of error

For linked relay outputs or current outputs, you can determine the behavior of the outputs in case of errors.

Depending on the use of the output, the behavior in case of errors is set in the following menus:

Output	menu
<i>Frequency controller</i>	<i>Frequency with error</i> (see section 4.5.5)
<i>Pulse-width contr.</i>	<i>Error pulse width</i> (see section 4.5.6)
<i>Recorder</i>	<i>Current with error</i> (see section 4.6.1)

#### Error events

The defined behavior occurs in the case of the following events or conditions:

- The linked sensor does not supply a valid measured value (display of *Init*, *Error*, "-----", or *OFL*)
- Communication of the MIQ/CR3; DIQ/CR3 with the IQ SENSOR NET controller is disturbed for longer than 2 minutes.
- The supply voltage for the MIQ/CR3; DIQ/CR3 is too low.
- In the *Recorder* function, the measured value of the linked sensor is outside the range between *Start value* and *End value*.

#### Freezing the states of the outputs

Independent of the specified behavior at error, the following conditions lead to the freezing of the output states:

- The linked sensor is in the maintenance condition (display of *Cal*, *Clean*, or a flashing measured value).
- Communication of the MIQ/CR3; DIQ/CR3 with the IQ SENSOR NET controller is disturbed for a short time. After the malfunction has lasted for 2 minutes the output changes to the specified behavior in the case of an error.

#### Resumption of the normal function

The relay output or current output automatically returns to its normal state as soon as all error conditions are over and all conditions causing a freezing of outputs are cleared.

#### 4.8.2 Behavior in non-operative condition

An output is non-operative when no function is activated for the output.

An output becomes non-operative in case of

- Power failure  
(As soon as the supply voltage is sufficient again, the non-operative condition of the outputs ends. The outputs function as specified by the user again.)
- Erasing a link to a sensor
- Changing the *Measuring mode* sensor setting for a linked sensor
- Changing the *Measuring range* sensor setting for a linked sensor



#### Note

Before editing sensor settings a note appears on the display to inform you that links will be erased when you change the *Measuring mode* or *Measuring range* sensor setting.

#### Settings in the non-active condition

##### Current output

Current: 0 A

##### Relay output

Relay: Open

## 4.9 Maintenance condition of sensors

The maintenance condition of sensors serves to calibrate, clean, service and repair (remove and replace) sensors.

In the maintenance condition

- the system does not react to the current measured value or the condition of the selected sensor
- linked outputs are frozen
- sensor errors do not prompt changes in the conditions of linked outputs.

The maintenance condition is automatically activated

- during calibration. After calibration the sensor remains in the maintenance condition until the maintenance condition is switched off manually (see section 4.9.2)
- during the cleaning cycle (see section 4.5.7)

Switch on the maintenance condition manually when you want to clean, service or repair (remove and replace) a sensor (see section 4.9.1).

When you have finished cleaning, servicing or repairing the sensor, switch off the maintenance condition manually (see section 4.9.2).



### Note

When a sensor is in the maintenance condition, the measured values or status indications of the sensor in the measured value display flash.

#### 4.9.1 Switching on the maintenance condition

1	Call up the measured value display with <b>(M)</b> .
2	Select the sensor you want to switch on the maintenance condition for with <b>(←)</b> . The measured values of the sensor do not flash.
3	Open the <i>300 - Display/Options</i> menu with <b>(OK)</b> .
4	Using <b>(←)</b> , highlight the menu item, <i>Switch maintenance condition on/off</i> or <i>Maintenance of sensor S0x</i> and confirm with <b>(OK)</b> . A window that informs you about the maintenance condition opens up.
5	Confirm <i>Continue</i> with <b>(OK)</b> . The selected sensor is in the maintenance condition. Linked outputs are frozen.
6	Call up the measured value display with <b>(M)</b> . The measured values of the sensor flash.

#### 4.9.2 Switching off the maintenance condition

1	Call up the measured value display with <b>(M)</b> .
2	Select the sensor you want to switch off the maintenance condition for with <b>(←)</b> . The measured values of the sensor flash.
3	Open the <i>300 - Display/Options</i> menu with <b>(OK)</b> .
4	Using <b>(←)</b> , highlight the menu item, <i>Switch maintenance condition on/off</i> or <i>Maintenance of sensor S0x</i> and confirm with <b>(OK)</b> . A window that informs you about the maintenance condition opens up.
5	Confirm <i>Continue</i> with <b>(OK)</b> . The maintenance condition of the selected sensor is switched off. Linked outputs are released.
6	Call up the measured value display with <b>(M)</b> . The measured values of the sensor do not flash.



## **5 Maintenance and cleaning**

### **5.1 Maintenance**

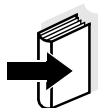
The combi output module does not require any special maintenance work. The general maintenance of IQ SENSOR NET components is described in the IQ SENSOR NET system operating manual.

### **5.2 Cleaning**

The cleaning of IQ SENSOR NET components is described in the IQ SENSOR NET system operating manual.



## 6 Technical data



### Note

General technical data on MIQ modules are given in the TECHNICAL DATA chapter of the IQ SENSOR NET system operating manual.

<b>Electrical data</b>	Nominal voltage	Max. 24 VDC via the IQ SENSOR NET (for details, see the TECHNICAL DATA chapter of the IQ SENSOR NET system operating manual)
	Power consumption	3 W
	Protective class	II
	Overvoltage category	II
<b>Instrument safety</b>	Applicable norms	<ul style="list-style-type: none"> <li>– EN 61010-1</li> <li>– UL 3111-1</li> <li>– CAN/CSA C22.2 No. 1010.1</li> </ul>
<b>Terminal connections</b>	IQ SENSOR NET connections	2 Additional connectable SENSORNET terminator (terminating resistor)
	Number of relay contacts	3
	Number of current outputs	3
	Terminal type	Screw-type terminal strip, accessible by opening the lid
	Terminal ranges	Solid wires: 0.2 ... 4.0 mm <sup>2</sup> AWG 24 ... 12 Flexible wires: 0.2 ... 2.5 mm <sup>2</sup>
	Line cross-section of cables carrying mains voltage	Europe: 1.5 ... 4.0 mm <sup>2</sup> USA:     AWG 14 ... 12
	Cable feeds	4 cable glands M16 x 1.5 on the underside of the module

<b>Relays</b>	Output	Physically separated from the IQ SENSOR NET
	Max. switching voltage	250 VAC or 24 VDC
	Max. switching current	5 A (AC and DC)
	Installation requirements	Fuse rating on the operator side: Maximum 5 A
	Relay functions	<ul style="list-style-type: none"> <li>– <i>System monitoring</i></li> <li>– <i>Sensor monitoring</i></li> <li>– <i>Limit indicator</i></li> <li>– <i>Frequency controller</i></li> <li>– <i>Pulse-width contr.</i></li> <li>– <i>Cleaning</i></li> <li>– <i>Sensor-controlled</i></li> <li>– <i>Manual control</i></li> <li>– <i>Alarm contact (MIQ/CR3 only)</i></li> </ul>

<b>Current outputs</b>	Output	Physically separated from the IQ SENSOR NET
	Output current	Can be switched between 0 - 20 mA and 4 - 20 mA In the case of errors, can be set to: 0 ... 21 mA
	Max. initial output voltage	15 V, in the case of missing or incorrect burden
	Max. load	500 Ω
	Accuracy	0.3 % ± 50 µA
	Functions	Programmable as: <ul style="list-style-type: none"> <li>– Analog output</li> <li>– PID controller</li> <li>– Output with fixed current value (for test purposes)</li> </ul>

## 7 Contact Information

### 7.1 Ordering & Technical Support

Telephone: (800) 897-4151  
(937) 767-7241  
Monday through Friday, 8:00 AM to 5:00 PM ET

Fax: (937) 767-1058

Email: [environmental@ysi.com](mailto:environmental@ysi.com)

Mail: YSI Incorporated  
1725 Brannum Lane  
Yellow Springs, OH 45387  
USA

Internet: [www.ysi.com](http://www.ysi.com)

When placing an order please have the following information available:

YSI account number (if available)	Name and Phone Number
Model number or brief description	Billing and shipping address
Quantity	Purchase Order or Credit Card

### 7.2 Service Information

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit [www.ysi.com](http://www.ysi.com) and click 'Support' or contact YSI Technical Support directly at 800-897-4151.

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for an YSI Service Center to accept the instrument for service. The Product Return form may be downloaded at [www.ysi.com](http://www.ysi.com) and clicking on the 'Support' tab.



## 8 Indexes

### 8.1 Explanation of the messages

In this chapter you will find a list with all the message codes and corresponding message texts that may occur in the log book of the IQ SENSOR NET system for the MIQ/CR3 output module.



#### Note

Information about

- Contents and structure of the log book and
- Structure of the message code

can be found in the LOG BOOK chapter of the IQ SENSOR NET system operating manual.



#### Note

All message codes of the output module MIQ/CR3 or DIQ/CR3 end with the number "411".

#### 8.1.1 Error messages

##### Message code

EA4411

*Current output range undercut*

*\* Check process*

*\* Check settings and, if necessary, change them*

EA5411

*Current output range exceeded*

*\* Check process*

*\* Check settings and, if necessary, change them*

EI3411

*Burden resistor too large (> 500 Ohm) or current loop interrupted*

*\* Check burden, terminal connections and connection lines*

#### 8.1.2 Info messages

The MIQ/CR3 or DIQ/CR3 output module does not send any info messages.









a xylem brand

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